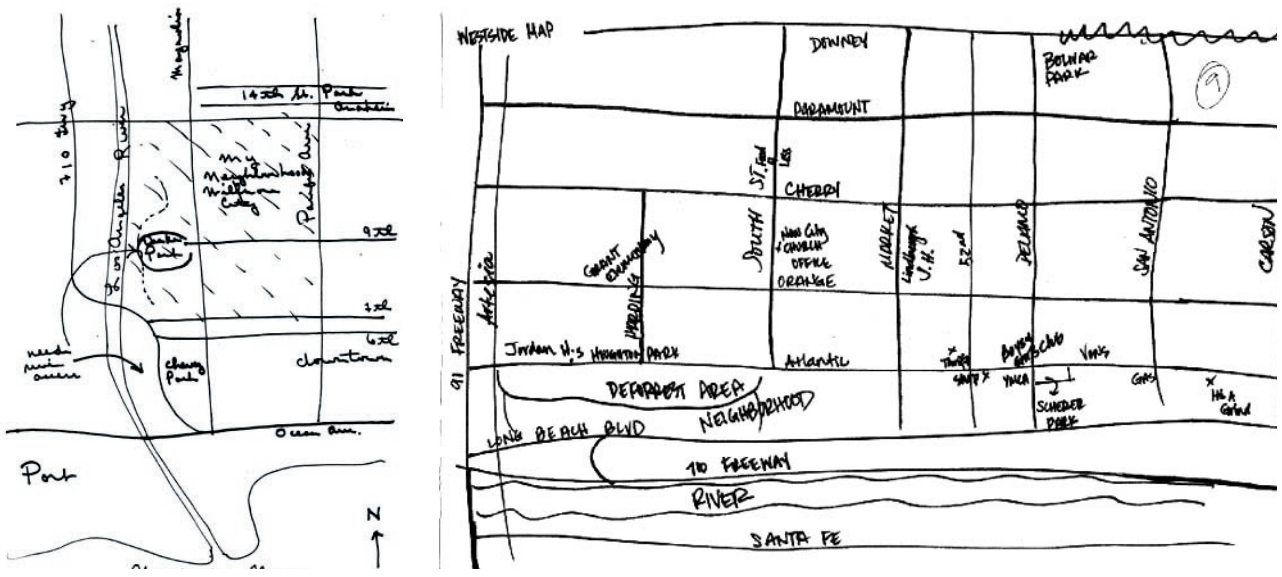
Appendices

Appendices

Appendix A
Community Outreach

As part of the planning processes undertaken in this project, the design team and the San Pedro Bay Estuary Project (SPBEP) conducted nine community outreach meetings including four visioning meetings and five *charrette* meetings. Additionally, the SPBEP attended numerous community group meetings in the westside of Long Beach; at least one member of the design team was present at each of these meetings as well. The outreach meetings provided the invaluable first hand information of Long Beach and the westside of Long Beach that the design team needed to conduct a proper study and propose appropriate design solutions.



Examples of Cognitive Maps Drawn by Meeting Participants

Visioning Meetings

The visioning meetings were held in March of 2003 and asked participants to relate feelings about their city, parks, and neighborhoods, and to draw cognitive maps of the westside of Long Beach and related features. The following questionnaire was given to the participants of the visioning Meetings.

Visioning Meeting Questionnaire

1. What first comes to your mind, what symbolizes the words "Long Beach" for you? What about Long Beach makes you proud? Least proud? How would you broadly describe Long Beach in a physical sense?

2. Please draw a quick map of the Westside. Make it as if you were making a rapid description of the city to a stranger, covering the important features. This is not expected to be an accurate map – just a rough sketch.

3. Could you please locate your neighborhood on the map? Please distinguish where the neighborhood ends. Where must one go to leave the neighborhood? Where are the 'gateways' to your neighborhood?

4. Please describe how you would get from your neighborhood to downtown, as if you were giving directions to a stranger. Picture yourself making the trip. What path-markers come to mind? We are interested in the physical pictures of things. It's not important if you can't remember the names of streets and places.
    a. What about the Los Angeles River?
    b. What, if anything, keeps you from taking a direct route?

5. Could you diagram your daily route to and from work? Do you take the same route both ways? Do you frequently stop on the way home for groceries or any other errands? If so, where do you stop? Do you regularly shop there?

6. What about your neighborhood is the most distinctive to you? These may be large or small, buildings, parks, certain trees, those elements which are easiest to identify and remember.
    a. Please describe at least two of these elements in further detail.
    b. Do any of these elements trigger a particular emotion?
    c. Please locate these elements on the map.
    d. If any of the elements have distinct edges; streets, streams, walls, etc., please draw them on the map.

7. Do you walk anywhere in your neighborhood? Where to? Do you walk on

a regular basis? Is there anywhere that you would like to walk to but can't? Why?

8. Do you bike anywhere in your neighborhood? Where to? Do you bike on a regular basis? Is there anywhere that you would like to bicycle to but can't? Why?

9. When walking or biking in your neighborhood, are there any parts of your route that feel unsafe? Why? What makes a safe environment for walkers and bicyclists?

10. Could you locate on the map where the parks in your neighborhood are? How long would it take you to walk to those parks? Could you describe that walk, is it pleasant or uncomfortable, safe or unsafe? Is there anything missing from these parks?

11. What types of park uses would you like to have in your neighborhood parks? What could enhance the natural environment of Long Beach?

12. Are there any unused or vacant areas in your neighborhood that could serve the community better? What could happen in these spaces? How would that benefit the community?

13. When was the last time you visited the Los Angeles River? How would you describe it? What makes the Los Angeles River different than classical images of other rivers? What could be done to enhance the experience along the river?

Charrette Meetings

The *charrette* meetings were held in April of 2003 and asked participants focused questions regarding the programming of parks in the westside of Long Beach. This questionnaire took the results from the visioning meetings and directed them towards neighborhood parks. As with the visioning meetings, a map exercise followed the questionnaire, asking participants to help conceptualize the programming and design of parks and greenways. The following questionnaire was used in the *charrette* meetings.

Charrette Meeting Questionnaire

<u>Part I; Los Angeles River Section</u>
Please circle all the answers that apply…

1. Do you have difficulty getting to the Los Angeles River by any of these methods?
   Bicycle only
   Pedestrian only
   Bicycle & pedestrian
   Never visit
   Other (please write in):

2. Which are the major routes that get you to, from, and around the Los Angeles River?

   Atlantic Ave
   Cedar Ave
   Chestnut Ave
   Daisy Ave
   I-405
   I-710
   Los Angeles River
   Long Beach Blvd
   Magnolia Ave
   Pacific Ave
   Pine Ave
   Wardlow Rd
   Other (please write in):

   Which district, section of the city or neighborhood would you most identify with where you live in Long Beach?

   Bixby Knolls
   Drake Park
   Downtown
   Other (please write in):

3. Which landmarks best help in orienting and identify where you are in Long Beach?

   Downtown Shoreline Hotels
   The Queen Mary
   Los Angeles River Bridges
   Memorial Hospital
   LB Performing Arts Center
   Other (please write in):

4. Which are the major transportation conflicts that you come across or against when trying to get to the Los Angeles River?

   Bicycles vs. Pedestrians
   Bicycles vs. Motorized Vehicles
   Pedestrians vs. Motorized Vehicles
   Other (please write in):

5. What are your concerns when it comes to safety issues at or near the Los Angeles River area?

   Generally safe
   Generally unsafe
   Lack of animation/desolate
   Lack of egress/escape routes
   Lack of police/security patrols
   Unsafe near river edge/lack of rails
   Unsafe at night
   Vagrancy/crime
   Other (please write in):

6. What general recreation types would you most like to be able to do along, at or near the Los Angeles River area?

   Active: (bicycling, in-line skating, horseback riding, team sports, etc.)

Community Meetings

Passive: (walking, sitting, viewing, etc.)
Both
Other (please write in):

7. How would you describe the Los Angeles River's character or qualities in Long Beach? Please circle all answers that apply…

Attractive
Clean
Comfortable
Dirty
Damaged from graffiti/vandalism
Natural
Noisy from highways/factories
Unattractive
Uncomfortable/hot
Underutilized/forlorn
Other (please write in):

Part II, Potential Parks Development Section

Answer the following questions in regards to the "potential" park sites and/or wetlands sites that you are familiar with in your council district. Please write the name for each park first, then answer these three questions briefly for each individual site.

1) Are you familiar with the potential site?

2) What transportation methods would you probably use to get to the potential site?

3) Would you consider the potential site safe or unsafe?

Example:
Downtown site
Familiar
Walk
Safe

8. How would you designate these potential parks based on size, need, and amenities? Write in below each category the name of the site you would feel best fits your family's and community's needs.

Park Designation	Size
Example Amenities	
Mini Park	under 2 acres
Art/statues, BBQ/Picnic areas	
Specific needs	
Benches/Seating	
Small games (horse shoe, chess, etc)	
Tot lot/playgrounds	

Please list the sites that fit this category:

Park Designation	Size
Example Amenities	
Neighborhood Park	2 – 10 acres
Activity center	
Neighborhood programs	
Ball Courts, Nature center	
Community gardens	
Educational/interpretation trails	

Please list the sites that fit this category:

Park Designation	Size
Example Amenities	
Community Park	10+ acres
Ball fields	
Community Programs	
Community center	
Cultural responses	
Skate park	
Habitat preservation	
Swimming pools	

Please list the sites that fit this category:

Park Designation	Size
Example Amenities	
Regional Park	175+ acres
Arboreta/botanic gardens	
Broad Influences	
Boating/marina	
Protect ecology & cultural resources	
Fieldhouse	
Multiple programs	
Museums	

Please list the sites that fit this category:

Answer the following questions in regards to the *"spotlighted* or *highlighted"* park sites and/or streetscapes that we will concentrate on in today's meeting. Please circle all answers that apply…

9. What types of amenities and/or attractions would you wish to have at these locations?

Activities for handicap & seniors
Art/sculptures
Ball courts/fields
BBQ/picnic areas
Bicycle facilities/trails
Bridle paths
Drinking fountains
Dog parks
Educational/nature exhibits
Lighting
Performance spaces
Playgrounds/tot lots
Pocket parks
Restrooms
Seating/benches/rest areas
Walking/interpretive trails
Water features/fountains
Other (please write in):

10. What types of urban natural features would you wish to have at these locations?

Children's/community gardens
Educational/interpretive plantings
Greenways/landscaped paths
Interesting landforms
Lawns/open expanses
Manicured landscapes/flowers
Native vegetation/restoration
Tree plantings/groves
Wetlands/river plantings
Wildlife habitat
Other (please write in):

Based on the responses from the visioning questionnaire, it was clear to the design team that many of the participants walk or bicycle in their neighborhood and occasionally to the LARIO trail along the Los Angeles River channel. Additionally, almost half of the respondents noted serious conflicts in the westside of Long Beach between bicyclists, pedestrians, and motorists. The respondents desire both active and passive recreational space, to include amenities such as better lighting, playgrounds, and seating areas. As mentioned in the Imageability section, nearly all the respondents recognized downtown Long Beach as a distinct part of the city, and defined smaller shopping areas across town as definable points that the RiverLink system should connect to. By far, the issue that received the widest response was safety in parks; many people noted problems with crime and vagrancy, mostly at night, and asked for increased security patrols.

The responses from the *charrette* questionnaire confirmed the findings from the visioning meeting and narrowed the focus to spotlighted sites within the RiverLink system. In addition, the respondents noted that new park sites should be designed with public restrooms and drinking fountains. They also asked for nature trails incorporated within the design.

The design team feels that the community outreach meetings were a success despite the lower than expected participant turnout. For future meetings, the turnout could be improved by increased advertising at grocery stores and outreach through local schools, ethnic businesses, and community groups reflecting the cultural diversity of the westside of Long Beach.

Appendix B
Further Case Study Research

by James Chaddick

This appendix contains further information about the River Reconnection Case Studies relevant to the design of the Long Beach RiverLink project.

Criteria for Case Study Selection:

- The city's riverfront was to be forlorn or under-utilized in the 20th century, usually by a single-issue planning measure such as flood control.
- The city and river studied at one time had historic or commercial links to the river system.
- The river was to be a linear riverine system of similar context to Long Beach's reach of the Los Angeles River.
- There was to be an occurrence of partial to full channelization. The natural character of the river system was to be altered by improvements such as flood control or other single-issue-driven planning.
- The river system was to be crossed by major highway and infrastructure elements that caused barriers to movement, and areas that could have safety issues.
- The river parkway system had to be adjacent to former industrial brownfield sites and urban influences to develop ideas on connecting to the urban fabric while using adaptive reuse of post-industrial sites and structures.

Case Study Project Descriptions

Many of the river parkway systems incorporate unique features specific to their cities. They all make significant efforts to connect to the existing parks and significant urban districts and neighborhoods. The 10.5-mile system in Denver connects five major parks with varied amenities such as sports facilities, retail shops, a planned aquarium, an amusement park, formal gardens, residential units, and entertainment facilities, punctuated by spectacular pedestrian bridges. It also connects to privately supported open and wild spaces and makes every effort for neighborhood access through trail systems and pedestrian promenades.

Hartford's 1.5 miles of river parkway system was designed to reconnect the struggling downtown to the river. The system has given new nightlife and weekend life to Hartford. It features hiking trails and entertainment spaces and builds on and extends existing plazas and open spaces. The parkway system has improved connections to East Hartford, the Hartford downtown, Charter Oak Park, "historic" Riverfront Plaza, an Olmsted Brothers-designed park, Great River Park and Riverside Park. "Riverfront Plaza has attracted more than 500,000 people for regattas, concerts, movie nights and other special activities" (Dillon, 2000, p.75). In the period of September 1999 to August 2000, the Hartford Riverfront Recapture Corporation estimated that an economic benefit to the City of Hartford of $17 Million was generated from the creation of the parkway system.

Phoenix's river parkway system made efforts to connect to commercial and retail shopping districts by connecting to Central Ave., Downtown and the Rio Salado redevelopment area known as "Beyond the Banks."

In Portland, the parkway system creates, enhances, and restores habitat areas. It teaches environmental education via an "urban nature trail." The walls, abutments, and paving patterns are punctuated by public art, used "to enhance the presence of art" (Hinshaw, 2001, p.71). The system contains three parks. "The design offers a continuous, meandering esplanade for strolling, jogging and biking. The esplanade is situated at the top of a sloping bank, retaining the portion nearest the water for natural habitat" (Hinshaw, 2001, p. 70). Habitat preservation is given a high priority. Walkways cantilever over the river in places. The trails consist of continual shifting views of urban and natural vistas, "contrasting the economy of the city with the ecology of the river" (Hinshaw, 2001, p.71).

Richmond's James River Canal Walk is a 1.25-mile corridor of parks, canals, shops, restaurants, marinas, hotels, residential housing, and museums. It was designed specifically to connect the downtown with the James River, Kanawha Canal, Haxall Canal, and Browns Island Park.

The Saint Paul parkway system on the Mississippi River near downtown Saint Paul, includes plantings of trees and shrubs native to the area, interspersed with businesses and housing. Through the Great River Greening Project, volunteers planted 37,000 trees . Connections are made to downtown, the Great River Park, Upper Landing Park (with a river theatre), the Science Museum of Minnesota, Swede Hollow park, Lilydale Regional Park, and Harriet Island.

The Yarkon River in Tel Aviv connects to Ganei Yehoshua Park, the major central park in the city, and "reinforces Tel Aviv's main leisure districts known as Park Hadarom, the Yarkon Promenade, and to the tourist areas along the seafront. The last two converge at the redeveloped port and Levant Fair area" (Israeli, 2003). The Ganei Yehoshua or Yarkon Park serves as a green lung for some two million inhabitants of the Dan (Tel Aviv) Metropolitan region. "Major efforts are going into monitoring and pest control, based on environment-friendly pest and biological control methods" (Israeli, 2003).

Planning Model

One of the most prominent reoccurring features to come out of these case studies is the coming together of many public and private groups and institutions. In every case, although not always specifically identified, there was the use of place-based planning and design in the creation of these systems. Additionally, in many cases, the river greenway system started from a single location and the momentum of that effort helped create the overall system. Such is the case of Denver where former State Senator Joe Shoemaker began a greenway foundation. This foundation was founded with the intention on "marking the meeting of the South Platte and Cherry Creek with a park" (Chandler, 2002, p.93). From that successful start, the whole parkway system developed.

As for Hartford, there was large public participation with many public and private funding partnerships. This led to the establishment of the Riverfront Recapture Corporation, in 1981, which is made up of the City of Hartford, the Town of East Hartford, and the Metropolitan District Commission, as managing partners for river redevelopment.

In Phoenix, the Rio Salado Citizens Advisory Committee was created and scheduled community meetings during the project development phase. Restoration of the river is part of overall redevelopment plan for the area.

The City of Richmond project combines economic redevelopment and historic preservation with a mandated public works project. A twenty-year development agreement was created by special legislation from the state assembly. It created a process for reviewing projects and imposed urban design guidelines. Zoning is frozen to prevent political gerrymandering. The agreement sets the legal framework on how parties work together and, per the master plan, all development must to relate to the Canal Walk. First floors must front the canal.

Saint Paul created the Saint Paul on the Mississippi Development Framework in 1997. The framework understands that quality of life is based on the ability of a city to effectively balance economy, environment, and society. It strongly suggests that such an approach "provides a primary competitive advantage in an increased global world" (Martin, 2001, p.63). The framework called for an "implementation agency to steward the projects along the riverfront known as *The Design Center*. The Design Center is a multijurisdictional planning and design office that reviews all plans for the public realm: streetscapes, bridges, and parks. It is made up of staff from a "full range of city departments" (Martin, 2001, p.63).

The Saint Paul on the Mississippi Development Framework outlined these guiding principals:

- Evoke a sense of place.
- Restore and establish the unique urban ecology.
- Invest in the public realm.
- Broaden mix of uses.
- Improve connectivity.
- Ensure that buildings support broader city building goals.
- Build on existing strengths.
- Preserve and enhance heritage resources.
- Provide a balanced network for movement.
- Foster public safety.

The creation of the Yarkon River Authority in 1988, became the first concerted effort in Israel to provide for river rehabilitation. The Yarkon River became the model for countrywide educational programs on river restoration through a teaching and research center on its banks.

Design Themes and Park Details

In many of the park systems, the majority of the primary materials that were used in the creation of amenities were concrete, stone, and steel. Stone was used where structures met ground level, with steel above the stone, as was the case in many of the amenities in Denver and other urban river parkway systems. Solid, simple, "clean and pragmatic choices were made in materials and design" (Dillon, 2000, p.73). These strong materials are able to handle exposure to the elements, along with the stresses of heavy use and vandalism.

Phoenix's Rio Salado system features environmental restoration efforts with plans for the transformation of a 5-mile section of the river and associated ecosystems. The plans include 88 acres of mesquite bosque, 14 acres of cottonwood/willow habitat, 39 acres of wetlands and marsh, 193 acres of Sonoran habitat, 57 acres of saltbush habitat, and 31 acres of aquatic strand. Another 160 acres of open space are planned, including an environmental education center, demonstration wetlands, and equestrian staging areas. Included are 10 miles of recreational and interpretive trails; also, wells and an associated water delivery system that brings water to the trees and other vegetation, wetlands, canals, ponds, and streams. The design allows for wildlife with the creation of spaces for water to collect, and uses a planting palette that provides shelter and food.

Portland's design speaks to the former uses of the sites that were along the east bank of Willamette River. Postindustrial artifacts such as piers and slurry piles are incorporated into the design. "Walks, railings, stairs and markers are made out of concrete stainless steel, metal grates and aluminum" (Hinshaw, 2001, p.70) for a playful postindustrial Disney-esque aesthetic. Materials used evoke former industrial sites and current highways.

An interpretive historic theme permeates the design for Richmond's James River Canal Walk. The original canal is used as a reference point for a "linear outdoor museum, which focuses on historic civic themes such as commerce, justice, labor, transportation, war, and renewal" (Mays, 2002, p.94). Historic themes are planned for the entire length, including a Richmond Civil War Center and historical murals.

The Saint Paul river corridor placed an emphasis on its tributaries as a cultural "watershed model, an entity that incorporates elements, communities and patterns... These elements include both ecological and the culturally significant such as sacred Native American sites and historic riverboat landings and other commercial uses" (Martin, 2001, p.66).

Obstacles and Adaptive Reuse

Each park system had to contend with obstacles such as freeways, floodwalls, railroad tracks, and retrofitting per ADA requirements. In most cases the systems made few or no alterations, or incorporated the infrastructure into the design. Many used items like highway design patterns and industrial elements as motifs to fit into design details. In Denver, former brownfield sites were cleared and capped. Sites included warehousing and light industry, paint manufacturing and storage, and an old car crushing plant. Portland made adaptive reuse of a decommissioned fire station and former industrial sites and remnant materials. Richmond restored and reused 19th century tobacco warehouses, ethyl refining plants, an Alcoa Aluminum factory site, a former Richmond Power plant, and the historic

Tredegar Iron Works site, which became a Civil War museum. Saint Paul reused the former Harvest States Grain Elevators for conversion to commercial development near Upper Landing Park. In Tel Aviv, the former port areas were converted to a pleasure craft marina and many adjacent industrial sites were converted to parklands.

Wayfinding and Orientation

In Denver, as well as in several of the other parkway systems, dolmens, or standing stones, are used as entry markers and intermediaries between urban areas, plazas, and park areas. Most systems use map kiosks, and Hartford gives out walking tour maps at several prominent entry locations and uses park rangers for interpretation and security. River gateways and interpretive signage are used in almost every case. Phoenix makes special significance to river gateways at certain bridges. Portland's river system uses highly distinctive "urban markers," drawing from industrial vernacular responses, which corresponds to urban grid and tell stories about the history and ecology of the river. Richmond's canal walk makes use of 29 large interpretive medallions, statues, historic structures and artifacts, and interpretive signage, woven throughout the parkway system. Saint Paul urban corridor tree plantings denote "stairs" that bring the city to the river.

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Appendix C
The Ecological and Social Benefits of the Urban Forest

By: Edward Anaya

Introduction

It is increasingly rare to come across a beautifully shaded avenue lined with mature, spreading trees that to many of us represents the ideal in urban and community tree plantings. Trees and urban forests are essential components of our communities and make communities more livable. Studies show that trees and shrubs improve a community's appearance, improve energy efficiency, improve water and air quality, increase property values, and create wildlife corridors. Trees are also a factor in retaining and attracting residents, which promotes community stability.

The effect of trees in climatic modification is presented, highlighting the value of shade and windbreaking effects. Street trees also mitigate noise pollution by buffering the noise level of the city. Storm water runoff and erosion are also reduced by trees. The urban forest sustains wildlife habitat by providing suitable environments and travel corridors for birds and other wildlife. Property values are also influenced by street trees, as their presence can increase the value and desirability of an individual lot and residential street. Perhaps most significantly is the rela-

tionship of street trees and the urban forest to the quality of life. The value of trees in our everyday lives should not be underestimated.

History of Urban Forestry

In 1967, before the term "urban forestry" became widely known, a group of foresters, educators, and business people working with trees in urban areas organized an information and idea-sharing network they called the California Urban Forests Council. Since 1968, and even more so since becoming a California public benefit corporation and being recognized by the IRS as a 501(c)(3) nonprofit organization in 1984, CaUFC has pioneered and shepherded the development of urban forestry throughout California. Through its efforts to promote urban forestry, CaUFC has grown to an organization of over 300 members from the public, private, and nonprofit sectors, and continues to expand its outreach to the growing network of people interested in urban forestry. Today, there are urban forest councils modeled after CaUFC in most every state (CaUFC).

What Is Urban Forestry?

Urban forests are all the trees and other vegetation that grow in places where people live, work, and play, from small communities in rural areas to large metropolitan cities. This includes trees on public and private land, along streets, in residential areas, parks, and commercial developments, and in other locations within a community. They may be planted by design or grow by accident (Miller, 1988).

Most communities are unaware of the existence and importance of urban forests. Perhaps a contributing factor is that the term "urban forest" is an oxymoron. An urban forest includes all of the vegetation in and around a dense human settlement (Miller, 1997). Some of these forested areas may have been intentionally planned and landscaped, while other forested areas are leftover from small tracts of land preserved during development or left unattended. When buildings and other man-made structures are included with the urban forest, a complex ecosystem exists.

Who Practices Community Forestry?

Community forestry is the act of caring for our natural environment through the planting and management of trees in our parks, open spaces, common lands, yards, and streets. Supporters of community forestry include private citizens, professionals, and governmental agencies. Private and governmental professionals involved in community forestry come from the fields of forestry, arboriculture, horticulture, wildlife, biology, natural resource conservation, and urban or environmental planning. Citizens' groups and grassroots organizations devoted to terrestrial and/or watershed protection, community outreach and education and other civic-minded activities are also involved. Citizens active in their communities promote community forestry by devoting attention, energy, and time to actively care for their surroundings (EPA, 2003).

How Does Community Forestry Begin?

Community forest management programs can begin in different ways. The impetus may be a concerned resident or group that promotes a community beautification project, or the influence of the environmental quality of a neighboring community. Whatever the reason, everyone in the community has the opportunity to make a personal contribution. The success of the forest management program will be determined by the cooperation of everyone involved (EPA, 2003).

Identifying Benefits and Costs of Urban and Community Forests

Benefits of the Urban Forest

- Trees benefit communities in a number of important ways, including: Increase in property values
- Decrease in energy costs
- Improvement in air quality
- Reduction in storm water runoff
- Decrease in soil erosion
- Improvement in water quality
- Creation of wildlife habitat
- Increase in community pride
- Positive impact on consumer behavior
- Increase in recreational opportunities
- Improvement in health and well-being
- Reduction of noise levels
- Creation of buffer zones

Increase in Property Values

Urban forests contribute to the economic vitality and stability of a community by increasing property values. Most people think that neighborhoods with trees are attractive places to live. The values of houses in these neighborhoods are usually higher than those of comparable houses in neighborhoods without trees (Morales, 1980; Morales et al., 1983; Anderson and Cordell,

1988). Neighborhood green spaces or greenways typically increase the value of properties located nearby (Kitchen and Hendon, 1967; More et al., 1983; Correll et al., 1978). Developers may profit when they receive a higher price for a property with trees. In many instances, careful preservation of existing trees during construction may actually cost less than clearing the land (Seila and Anderson, 1982). The cost of preserving trees, such as the extra time needed for planning and using special techniques to protect the trees, should be looked at in relation to the immediate and long-term benefits of increased property values. Mature trees are especially valuable in areas where old housing or buildings have lost value. This is important to keeping downtown neighborhoods vital.

Decrease in Energy Costs

Trees can help reduce heating and cooling costs by shading buildings, acting as windbreaks, and cooling the air through the evaporative process of transpiration. When planting a tree to reduce energy costs, the species of tree, site location, type of building, and year-round climate should be considered. Reducing the need for electricity or gas energy also conserves fossil fuels and reduces carbon emissions. However, planting the wrong tree in the wrong place may increase energy costs.

Shade

Trees properly placed around buildings and air conditioning units can help reduce cooling costs (McPherson, 1994b). Trees reflect and absorb solar radiation before it heats the dense building and pavement materials of a home or office. Usually, trees planted to the west of a building reduce air conditioning costs the most, by blocking the afternoon summer sun when it is the hottest. There are times when trees located to the east and south of a building also provide this benefit. In tropical climates, an evergreen tree offers protection from the sun throughout the year (Harris, 1992). In colder climates, trees located south of a building should be avoided because their winter shade increases heating costs more then summer shade reduces cooling costs. The shade from trees can also reduce exposure to ultraviolet radiation, which increases the risk of some types of skin cancer.

Windbreak

Properly placed trees can reduce heating costs for a building by blocking the wind (McPherson, 1994b). Although both conifers and deciduous trees reduce wind speed, conifers tend to have a greater impact during winter months. The density, or compactness, of the trees and the planting location determine the amount of wind reduction that occurs (Harris, 1992). In cool and windy climates, windbreak trees should be planted to the west and north of a building.

Evaporative Cooling

Urban areas typically are warmer than rural areas because of the urban "heat island" effect. Buildings, paved areas, and sparse tree canopy in an urban area contribute to the higher temperature. Trees help to reduce the air temperature around them through the evaporation of water from their leaves, acting as nature's air conditioner.

Improvement in Air Quality

Air pollution is not only a major human health risk, but also reduces visibility and damages vegetation and man-made materials. Some species of trees do release chemical compounds (biogenic emissions) that are air pollutants. The amounts of these chemicals produced depend on the species and size of the tree. Because high temperatures increase the production of these chemicals, urban heat islands cause this type of pollution to increase. Urban trees, however, contribute less than 10 % of total pollution emissions in urban areas (Nowak, 1992), and the advantages they provide in reducing air pollution are much greater. Trees and vegetation improve air quality in several ways:

- Absorption and reduction of airborne pollutants.
- Trees, especially those with large leaf-surface areas (Nowak, 1994), absorb and trap airborne dirt and chemical particles, such as nitrogen oxide, sulfur dioxide, carbon monoxide, and ozone. Trees also help by reducing wind speed so that heavy particles settle out (Harris, 1992). Communities benefit not only from cleaner air, but also from the reduced cost of implementing air pollution controls.

Absorption of Carbon

Carbon dioxide, a by-product of burning fossil fuels such as gas and coal, is one of the primary chemical compounds that influences global warming (Akbari et al., 1992). Urban forests in the United States store millions of tons of the carbon from this compound annually, helping reduce the level of carbon dioxide in the atmosphere (Rowntree and Nowak, 1991). However, their effect on the carbon dioxide levels in cities is being studied.

Reduction of Carbon Emissions

The cooling effect of trees, including shade and evaporative cooling, decreases the demand for electricity. This results in the reduction of car-

bon emissions from power plants supplying the energy. Trees, therefore, provide the double benefit of not only storing carbon, but also helping to reduce carbon emissions.

The Cycle

Trees and other plants make their own food from carbon dioxide (CO_2) in the atmosphere, water, sunlight, and a small amount of soil elements. In the process, they release oxygen (O_2) for us to breathe. Trees also:

- Help to settle out, trap and hold particle pollutants (dust, ash, pollen, and smoke) that can damage human lungs.
- Absorb CO_2 and other dangerous gasses and, in turn, replenish the atmosphere with oxygen.
- Produce enough oxygen on each acre for 18 people every day.
- Absorb enough CO_2 on each acre, over a year's time, to equal the amount you produce when you drive your car 26,000 miles. Trees remove gaseous pollutants by absorbing them through the pores in the leaf surface. Particulates are trapped and filtered by leaves, stems and twigs, and washed to the ground by rainfall.

Air pollutants injure trees by damaging their foliage and impairing the process of photosynthesis (food making). They also weaken trees making them more susceptible to other health problems such as insects and diseases.

The loss of trees in our urban areas not only intensifies the urban heat-island effect from loss of shade and evaporation, but we also lose a principal absorber of carbon dioxide and trapper of other air pollutants as well.

Some of the major air pollutants and their primary sources are:

- Carbon dioxide: burning oil, coal, and natural gas for energy; decay and burning of tropical forests.
- Sulfur dioxide: burning coal to generate electricity.
- Hydrogen fluoride and silicon tetra-fluoride: aluminum and phosphate fertilizer production; oil refineries; steel manufacturing.
- Ozone: chemical reactions of sunlight on automobile exhaust gases. Ozone is a major pollutant in smog.
- Methane: burning fossil fuels; livestock waste; landfills; rice production.
- Nitro oxides: burning fossil fuels; automobile exhausts.
- Chlorofluorocarbons: air conditioners; refrigerators; industrial foam.

The burning of fossil fuels for energy and large-scale forest fires are major contributors to the buildup of CO_2 in the atmosphere. Managing and protecting forests and planting new trees reduces CO_2 levels by storing carbon in their roots and trunk and releasing oxygen into the atmosphere (Maryland Department of Natural Resources, 2003).

Trees help cool the heat island effect in our inner cities. These islands result from storage of thermal energy in concrete, steel and asphalt. Heat islands are 3 to 10 degrees warmer than the surrounding countryside. The collective effect of a large area of transpiring trees (evaporating water) reduces the air temperature in these areas (Maryland Department of Natural Resources, 2003).

Trees Fight the Atmospheric Greenhouse Effect:

Trees fight the atmospheric greenhouse effect. The greenhouse effect is created when heat from the sun enters the atmosphere and is prevented from radiating back into space by air-polluting gasses. The buildup of about 40 heat-trapping gasses is created mostly by human activities. Heat buildup threatens to raise global temperatures to levels unprecedented in human history. About half of the greenhouse effect is caused by CO_2. Trees act as a carbon sink by removing the carbon from CO_2 and storing it as cellulose in the trunk while releasing the oxygen back into the air. A healthy tree stores about 13 pounds of carbon annually, or 2.6 tons per acre per year. Trees also reduce the greenhouse effect by shading our homes and office buildings. This reduces air conditioning needs up to 30 %, thereby reducing the amount of fossil fuel burned to produce electricity. This combination to CO_2 removal from the atmosphere, carbon storage in wood, and the cooling effect makes trees a very efficient tool in fighting the greenhouse effect (Maryland Department of Natural Resources).

Improvement in Water Quality:

Waterways and lakes in and near urban areas can be polluted by soil erosion and water runoff that contains fertilizers and pesticides from landscaped lawns and trees, oil, and raw sewage. Trees and vegetation can help solve water quality problems in communities by reducing storm water runoff and soil erosion. Trees also absorb some of the nutrients in the soil that would be washed away. Communities can have cleaner water by managing existing natural vegetation, planting additional trees, and reducing the use of pesticides and fertilizers.

Rate and Volume of Runoff

In many communities, the rate and volume of storm water runoff has increased beyond the capacity of existing storm water drainage systems. This is caused by continued development of hard, impermeable surfaces such as roads and parking lots that cannot absorb water, thus changing natural drainage patterns. These impervious surfaces also reduce the amount of natural absorption of water by the soil and trees. Many urban forestry activities, such as creating open spaces, saving trees on construction sites, and planting trees after construction, can help reduce the amount of storm water runoff that enters the drainage system.

Raw Sewage Spillover

During heavy rainstorms, problems occur when storm water floods into the sanitary sewage system. If the sewage treatment facility cannot handle all the storm water runoff, raw sewage spills over into natural waterways. This can cause a dangerous increase of bacteria in the water. Communities with this problem may be charged large fines, suffer lawsuits from downstream users of the waterways, have to make costly improvements to the sanitary sewer system, or have to stop further development until water treatment facilities are improved. Trees, vegetation, and wetlands can help prevent this problem by interrupting and absorbing storm water runoff.

Soil Erosion

Trees can limit soil erosion by helping control storm water flow. Fibrous root systems hold soil in place so that it is not washed away by rain or flowing water (Harris, 1992). Erosion can be especially severe at construction sites in urban areas. Research has found that while forested land can lose about 50 tons of soil per square mile per year, developing areas can lose 25,000 to 50,000 tons (Lull and Sopper, 1969).

Creation of Wildlife Habitat

Urban forests serve as wildlife habitat, supplying food, water, and cover for a variety of animals, such as deer, squirrels, rabbits, reptiles, and birds. These animals enhance the recreational and educational opportunities of the community. Wildlife habitats range from streamside buffers and storm water detention ponds to backyards and parks. Corridors of trees and other vegetation connecting natural areas in the urban environment add to the wildlife habitat and increase wildlife diversity.

Increase in Community Pride

Trees are a significant part of a community, offering important benefits not easily measured.

Community Image

Imagine what a community would be like without any trees. Trees and other landscaping add beauty to an urban area. Retailers often landscape their premises to improve community image and attract customers. A visitor's first impression of a community is greatly influenced by the trees and other landscaping.

Sense of Place

Neighborhoods with attractive landscapes foster a sense of community and belonging (Dwyer et al., 1991). People often identify with their own community by its tree-lined streets and historic groves of trees. Trees may also be associated with specific places, such as palm trees at a beach, or memories of past events or times, such as a favorite tree climbed as a youth.

Community Involvement

Community pride increases when neighborhood residents participate in local tree-planting programs. Such activities enhance a sense of ownership and an ongoing interest in developing and maintaining trees. This participation increases the success rate of the planting program. However, without local involvement in the planning and planting of the trees, the efforts may be viewed negatively by the residents (Miller, 1988).

Historical Trees

Many communities have historical trees that have become landmarks. They may also be a focus point in the community's identity, such as the live oaks or magnolias that are part of the culture in many southern cities.

Decrease in Violence

Less violence occurs in urban public housing where there are trees. Researchers (Sullivan and Kuo, 1996) suggest that trees afford a place for neighbors to meet and get to know each other. Their research showed that friendships developed into a network of support.

Positive Impact on Consumer Behavior

Research from the University of Washington indicates that in business districts "...healthy and well-maintained trees send positive messages about the appeal of a district, the quality of products there and what customer service a shopper can expect" (Wolfe, 1998).

Increase in Recreational Opportunities

Many city residents appreciate the recreational benefits urban forests provide. With the growing emphasis on physical fitness, urban forests, parks, and open spaces have become increasingly popular as places to walk, run, bike, and hike. Urban parks are often sites for large community events, such as art and music festivals. Some festivals are centered around trees such as the Cherry Blossom Festival in Macon, Georgia and the Dogwood Festival in Paducah, Kentucky.

Improvement in Health and Well-being

Life in a bustling urban setting can be both physically and mentally stressful, but there are indications that trees and other plants help improve human health.

Physical and Mental Health

The soothing influence of trees can help reduce stress levels and increase enjoyment of everyday activities.

Recuperation Rates and Therapy

One study of recuperation rates after surgery found that patients whose windows offered a view of a wooded landscape recovered faster and with less medicine than patients who could only look out on brick walls (Ulrich, 1984). Therapists are now using trees and other plants to help people with physical and mental problems.

Part of Nature

Trees bring urban residents closer to nature. A healthy urban forest is the most effective way to reestablish this sense of being part of the larger natural environment. Some people have a strong emotional attachment to trees. The "People-Plant Council" at Virginia Tech University, Blacksburg, Virginia is one group that studies the ways that trees improve our health and well-being.

Reduction of Noise Levels

Trees and vegetation can form a barrier that partially deadens the sound from traffic, lawn mowers, and loud neighbors. To be effective, the landscaping should be dense, tall, and wide, and planted close to the source of the noise. Trees also create background noise of rustling leaves and wind through the branches that can help muffle other noises (Harris, 1992).

Creation of Buffer Zones

Trees serve as screens by hiding unattractive areas and objects, such as junkyards and dumpsters. With proper design, tree plantings can also redirect attention away from unsightly areas. Planting designs can be used to direct automobile or pedestrian traffic.

Costs of the Urban Forest

A healthy urban forest requires an investment of money. The cost of urban trees varies widely and depends upon such site factors as location, species, and maintenance needs. Each of these factors needs to be considered when deciding to plant, maintain, or remove a tree in an urban area, whether it be an individual tree or a large-scale planting. With careful planning and coordination, these expenses can be minimized. Some of the costs involved in urban forestry are:

- Planting
- Maintenance and removal
- Infrastructure repair
- Litigation and liability
- Storms
- Program administration
- Allergies

Planting

The cost of planting depends on the species, size, site location, site preparation, and labor. Planting costs include purchasing the trees themselves and paying for site preparation, installation, and initial care. In 1994, McPherson found that planting and establishing a tree often represents a large percentage of total cost. Usually, the larger the tree, the higher the planting cost. Many problems and future costs can be avoided by tree selection, site preparation, and planting techniques.

Maintenance and Removal

Maintenance costs vary tremendously and depend on the species and site location. It is important to know what funds and personnel are available for maintenance work. By providing regular maintenance, future costs can often be prevented while increasing the tree's value. Some of the major maintenance costs are:

Pruning

All trees require periodic pruning, but the frequency depends on the species, age of the tree, and location. Young trees need frequent pruning to develop a strong branching structure. The amount of pruning needed is also related to the site location. Trees located near overhead utility lines or sidewalks need more frequent attention.

Choosing a species that is compatible with the site will help reduce pruning costs.

Irrigation

In some locations, irrigation systems are needed to supplement rainwater. The cost of installing the irrigation system and supplying water are part of the maintenance cost. Irrigation can keep the tree from being stressed during droughts. However, the soil moisture needs careful monitoring to prevent overwatering, which can also cause stress. Generally, species native to the area do not need irrigating after establishment. Selecting a drought-tolerant species can help reduce irrigation costs.

Insect and Disease Control

There are times when trees need to be treated for insects and disease. Costs of insect and disease control can be reduced by selecting a species that is resistant to insects and disease, planting a variety of species, matching species to the site, and using proper planting techniques.

Tree Removal

Trees need to be removed in urban areas for many reasons. Hazardous trees, which are trees that have potential to fail and hit a target, can cause injuries or death and damage personal property. A tree may also need to be removed if it is interfering with water and sewage pipes or utility lines. However, it may be cheaper to relocate utility lines than remove the trees. Many trees need to be removed because of storm damage. Usually, the larger the tree, the more it costs to remove. Matching the growth habits of a tree to site conditions will increase its vitality and life span and avoid its untimely removal.

Tree Residue from Pruning and Removal

When trees are pruned or removed, the residue must be recycled or disposed of. Sending the residue to the landfill is a costly option for some communities. Many communities, homeowners, and utility companies now recycle tree residue into mulch, firewood, compost, and boiler fuel instead of sending it to the landfill. These alternatives may reduce costs and even generate revenue.

Infrastructure Repair

Tree growth can damage the infrastructure of a community, such as utilities, sidewalks, curbs, and sewer and water pipes. Sometimes repairs can cost less than removing and replacing the trees. Proper site and tree selection can prevent or minimize future infrastructure conflicts.

Litigation and Liability

There can be legal costs when trees are damaged or when trees cause damage. Property owners may sue when trees are harmed by construction on adjoining property, or when trees die after underground utilities lines are installed. Trees are sometimes stolen, especially unique specimens or rare species. The damage caused by falling trees or limbs, such as during storms or from hazard trees, can also result in legal action. Sidewalks damaged by tree roots can cause trip-and-fall accidents, a common source of liability claims. Careful planning can preclude many of the costs related to the damage of trees during development and construction projects. Selecting an appropriate species for the location and assuring proper maintenance can decrease the injuries and damage caused by trees.

Storms

Storms, such as hurricanes, tornadoes, ice, snow, and wind, can cause major damage to the trees and property in a community. Costs of cleaning up, repairing, and replanting after storms can be minimized by diligent maintenance.

Program Administration

Managing the urban forest requires planning and a trained workforce to carry out those plans. Communities must pay the costs of the people and materials used in these programs.

Allergies

Trees produce pollen that causes allergies for some people. Individuals have the expense of doctor visits and medication. Cities, in an effort to lessen the problems by controlling or regulating the type of trees planted, may incur additional management expenses.

General Guidelines for Planting and Selecting Trees

Site Location

The site location offers clues on potential stresses that may impact tree health and maintenance. For example, a tree located on a downtown sidewalk will probably require more maintenance than one located in a park. Sites where there is pedestrian and vehicular traffic require special attention.

Streets, Sidewalks, and Other Paved Areas

If the site is located near a street, sidewalk, bike path, or other paved area, several site factors must be considered.

- Pedestrian and vehicular areas. For any site near where pedestrians or vehicles travel, tree species selection is critical. Species with thorns or prickly foliage or soft, messy fruit should be avoided. Trees with drooping branches will require frequent pruning. For public safety, it is always important that traffic lights, signs, and intersections not be obstructed by trees.

- Conflicts with roots and pavement. Tree roots may grow under asphalt or cement pavement, which can cause the pavement to crack and buckle. Some communities have tried using root barriers and root training to avoid root-pavement conflict. There are different types of root barriers, from cylinders to herbicide strips that are placed in the planting site. They are designed to physically deflect the roots away from the pavement. In some cases they do prevent root growth near sidewalks, but they may also limit tree growth. Root training is an option that uses chemical and physical barriers, deep fertilization, and irrigation or aeration structures to improve the soil conditions in the deeper soil horizons. If the barriers are successful, the roots will grow deeper, avoiding surface problems such as cracked sidewalks.

Types of Planting Sites

Several types of planting sites are unique to urban areas, including street lawn, tree pit, and roadway. These sites may require special considerations when selecting a species and choosing a proper planting technique.

Street Lawn

The street lawn, also known as the tree lawn, is the space between the curb and the sidewalk. Depending upon on the mature size of the planted tree, the street lawn should be at least three feet wide. If there is a choice, a street lawn is preferred to a tree pit because the street lawn has a continuous strip of soil. Do some checking before planting in a street lawn because of the potential conflicts with pavement, utilities, and local highway department guidelines.

Tree or Planting Pit

Tree or planting pits are small areas of soil within a sidewalk, parking lot, or other paved area. They are common in urban areas because often this is the only space available for planting trees. They also offer the advantage of softening the hardscape in urban areas. Trees planted in tree pits usually require special attention because of the unique growing conditions at the site.

Roadway

Tree plantings in the median and on the sides of the roads provide many benefits such as intercepting dust and particulate matter; reducing glare, noise, wind, and erosion; visually separating opposite lanes of traffic; and reducing mowing costs. However, trees near roadways can be damaged by vehicles, lawnmowers, string trimmers, and herbicides.

Knowing the soil conditions near a roadway is essential to selecting a site. Drainage problems are common because the sites usually have disturbed soil that has been placed on top of compacted soil. It is also common to find construction rubble from road projects in the soil. Planning helps to avoid future problems with the trees and the pavement.

The state department of transportation usually has specific guidelines for plantings near roadways, such as species selection, planting distance from pavement, and distance between trees. It is important to work with them, especially during the planning phase.

Selecting a Tree Species

Trees may experience different types of stress and respond to stress in different ways. Some tree species can tolerate stress, such as poor soils and adverse environmental conditions, better than other species.

Growth Factors

Several factors related to growth should to be considered when selecting a species.

Mature Size and Form

The mature size and form of the tree crown and root system are important because of potential interference with utility lines, pavement, structures, and signs. For example, it would be best to select a small or medium-size tree for a site located under a utility line.

Growth Rate

The reason for planting a tree may make the growth rate important in selecting the species. A fast growth is important for trees planted for shade or screening. However, some fast-growing species have weak wood and are prone to breakage. This makes the tree susceptible to storm damage and other hazards. Growth rate may affect how well the species compartmentalizes injuries.

Branching Pattern

Alternate branching patterns are strongest and, therefore, preferable. Some species grow this way naturally, and others can be trained to do this with early pruning. The branching pattern is important when selecting at tree for a site that is subject to strong winds and storms.

Leaves

Most hardwoods are without leaves in the winter while evergreens have needles all year long. This is important when planting a tree to reduce energy costs for a building. There are positive and negative considerations about the leaves of different species, including fall color, thorns, or prickly foliage.

Flowers, Fruits, Seeds, and Bark Texture

Often a species is selected for the flowers, fruits, or seeds that it bears, or the texture of its bark. It is important to know the type of flower, fruit, and seed the tree produces, and how often this cycle occurs. The flowers, fruits, and seeds may be a source of beauty or food, or they may cause problems because of the litter, smell, or seeds they produce. This is especially true if the tree is near a sidewalk or road.

Soil Requirements

Each species of tree has different soil requirements but may adapt to a range of soil conditions. Some species can tolerate wet or compacted soils, while others are more drought tolerant. Species may also have different soil pH requirements and need different amounts of nutrients for healthy growth. If soil conditions are less than optimum for a specific species, it may be best to select either another site for the tree or another species for that site.

Selecting Tree Stock

General Appearance

- A healthy, well balanced crown
- No signs of insect or disease damage

Trunk, Branches, and Bark

- Straight, single trunk
- Trunk centered and firmly attached to rootball
- Evenly distributed branches with wide angle of branch attachment
- No severe pruning cuts, scars, swollen or sunken areas, or wounds
- No insect or disease damage, such as borer holes
- No paint on wounds or cuts
- Usually smooth bark with no cracks, splits, or sunken areas
- Bright green underneath top layer of bark

Healthy Leaves

- Green to dark green leaf color depending on the species and season
- No insect or pesticide damage, such as bare spots or discoloration

Roots

- Healthy, white roots with evenly distributed lateral growth
- No circling or matted roots (However, if the tree has circling roots, cut them in several places to prevent them from becoming girdling roots. For matted roots, making two or three vertical slices into the rootball with a sharp knife, or loosen the roots carefully by hand.)
- No girdling of roots

Source of Tree Stock

Tree stock survives best if it is planted in the same climate and soil conditions in which it was originally grown. Find out where the tree was grown when purchasing stock for planting. For example, a tree grown in a Texas nursery may not adapt well to a site in Virginia.

Conclusion

Urban and community forestry can make a difference in our lives. Each one of us can make a personal contribution. As we develop and apply technologies for a better way of life, the side effects often adversely affect our natural environment. For example, in our urban areas summer temperatures and noise levels are higher than in the surrounding countryside. Air pollution problems are more concentrated, and the landscape is significantly altered, reducing personal health benefits previously available to us by having access to wooded areas and green open spaces. Trees help solve these problems. Currently, 85 % of us live in cities and towns and we can act individually to improve our natural environment through the planting and care of trees on our own streets, and corporately through supporting community-wide forestry programs. Through technology we are learning more about trees and how they benefit mankind, and how each one of us can do a better job of planting and caring for these trees that make up our own urban forests.

The urban forest is an indicator for the health of the humans in that area. In short, our health can be judged by the health of our urban forests.

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Appendix D
Targeted Wildlife Species

Cataloged in this appendix are habitats and special features that could possibly attract targeted wildlife species. Based on the Seattle Urban Nature Project classifications, the habitats which could reasonably be recreated along the river channel, and the wildlife they could potentially attract, are listed below. This information was adapted from the CH2M Hill Feasibility Study completed in May of 2002, and the California Department of Fish and Game.

Riparian Woodland

Potential Species not State or Federally Listed: green heron (*Butorides virescens*), black-crowned night-heron (*Nycticorax nycticorax*), downy woodpecker (*Picoides pubescens*)

State Listed Species of Special Concern: yellow-breasted chat *(Icteria virens)*, yellow warbler (*Dendroica petechia*), two-striped garter snake (*Thamnophis hammondii*), southwestern pond turtle (*Clemmys marmorata pallida*), arroyo chub (*Gila orcutti*)

Mulefat Shrubland

Potential Species not State or Federally Listed: American goldfinch (*Carduelis tristis*), blue grosbeak (*Guiraca caerulea*), Anna's hummingbird *((Calypte anna)*, Allen's hummingbird (*Selasphorus sasin*), black-chinned hummingbird *(Archilochus alexandri*), fatal metalmark (*Calephelis nemesis*)

Emergent Wetland/ Open Water

Potential Species not State or Federally Listed: yellow-headed blackbird (*Xanthocephalus xanthocephalus*), pied-billed grebe (*Podilymbus podiceps*), marsh wren (*Cistothorus* palustris), common moorhen (*Gallinula chloropus*), American coot (*Fulica americana)*, cinnamon teal (*Anas cyanoptera*), Virginia rails (*Rallus limicola*)

State Listed Species of Special Concern: least bittern (*Ixobrychus exilis*), tri-colored blackbird (*Agelaius tricolo*r),

Open Water

Potential Species not State or Federally Listed: western grebe (*Aechmophorus occidentalis*), ruddy duck (*Oxyura janaicensis)*, gadwall (*A. strepera*), and American wigeon (*A. americana*)

Flowing Streams

State Listed Species of Special Concern: southwestern pond turtle (*Clemmys marmorata pallida*), arroyo chub (*Gila orcutti*).

Tidal Wetlands

Potential Species not State or Federally Listed: marbled godwit (*Limosa fedoa*), willet (*Catoptrophorus semipalmatus*), whimbrel (*Numenius phaeopus)*, American avocet (*Recurvirostra americana*), western sandpipers *(Calidris mauri)*

Back Dunes

Federally Listed Threatened Species: western snowy plover (*Charadrius alexandrinus nivosus)*

The special design features catalogued below will be used in park and open spaces along the river greenway to provide characteristics which wildlife look for in potential habitats. This information was adapted from the CH2M Hill Feasibility Study completed in May of 2002, and the California Department of Fish and Game.

Tall Trees

Potential Species not State or Federally Listed: red-shouldered hawk (*Buteo lineatus*), black-headed grosbeak (*Pheucticus melanocephalus*), warbling vireo (*Vireo gilvus*), northern oriole (*Icterus galbula*), Swainson's thrush (*Catharus ustulatus)*

State Listed Species of Special Concern: Cooper's hawk (*Accipiter cooperii*)

Mast-Producing Trees

Potential Species not State or Federally Listed: western gray squirrel (*Sciurus griseus*)

Barren Islands

Potential Species not State or Federally Listed: killdeer (*Charadrius vociferus*), American avocet (*Recurvirostra americana)*, and black-necked stilt *(Himantopus mexicanus)*

Nest Boxes and Snags

Potential Species not State or Federally Listed: tree swallows (*Tachycineta bicolor*), western bluebirds (*Sialia mexicana*), house wrens (*Troglodytes aedon*), ash-throated flycatchers (*Myiarchus cinerascens*), as well as multiple species of bats

Basking Sites

State Listed Species of Special Concern: southwestern pond turtle (*Clemmys marmorata pallida*)

Loose or Sandy Soils

Potential Species not State or Federally Listed: California ground squirrel (*Spermophilus beecheyi*)

State Listed Species of Special Concern: California legless lizard (*Anniella pulchra pulchra*).

This represents wildlife that either currently exists or could be reasonably supported in potential park sites along the Los Angeles River.

Appendix E
The Complexity of Uses in Public Space Design: A Study of the Design of Successful Urban Public Spaces

By: Jeremy Person

> *"Landscape architects must be advocates of 'true publicness' in our public places."*
> – *Louise Mozingo* (Mozingo,1995, p. 42)

If one were to look at many of the historic public squares and piazzas of the world, he or she would notice a commonality among them. These spaces, used by different cultures with different values throughout their histories, share the quality that they are seemingly void of programmed design elements. They are typically large, open paved spaces thought to accommodate massive gatherings, such as markets or chariot races. The Piazza Del Campo in Sienna, Italy and the National Mall in Washington, DC are historic examples of such spaces. Each was designed to accommodate various civic functions while allowing easy public access. By design, these spaces adapt to different uses brought by different communities and cultures.

This is the quality that makes public space great. The world around us changes day by day, and great places must accommodate that change in their design. In a sense, they are able to morph; dynamically change in function in order to meet a community's needs. An urban square can serve as a market one day and as theatrical stage the next. A small turf area can be the site of a children's game in the morning and a shady lounging spot in the hot afternoon. A downtown plaza can become a forum for a grassroots environmental group, or a relaxing lunch spot for an office worker. Great civic spaces are able to mesh with the complexity of our ever-changing daily lives, allowing comfort and stability in a rapidly changing society. This is why the public loves and uses public space.

When public space becomes what philosopher Michael Walzer calls "single minded space", or public space that is designed with one objective in mind, it loses those qualities present in the great spaces of the world. Instead, people move quickly through these spaces and they serve little civic function, causing alienation between user groups and the community (Walzer, 1995).

Landscape architect Walter Hood points out in his book *Urban Diaries*, that "social injustices are created when certain uses are ignored or not provided for in the park, sometimes causing conflicts when unprogrammed uses occur" (Hood, 1997, p.8). True public space brings communities together on an informal level allowing people to interact and loiter freely, things that are sometimes overlooked in contemporary open space design.

Our charge as designers is to promote the design of public spaces that can serve the changing needs of a community. Over the life span of a built space, which can be hundreds of years, user groups will inevitably change. How can we design to adapt to changing interests? Walter Hood asks, "What strategies would better allow the voices of the community residents to be heard?" (Hood, 1997, p.8). Urban communities are screaming for public space that is open to their interests; many urban parks are degraded and vandalized causing communities to turn their backs on parks rather than taking ownership over them. As urban designers, we must take up this challenge and respond to the community's voices.

The modern city is thought to have emerged from the social changes brought by the industrial revolution, which changed the structure of human settlements. The revolution brought with it new technologies which spurred industry and generated the idea of mass production. The global economy boomed and thousands of workers were needed to keep the factories going. Wage labor spread and became the livelihood for families trying to survive. Philip Kasinitz writes that these actions formed the modern way of life. However, "the most overriding characteristic of modernity is its dynamism. The modern world is a world of change, change unprecedented in its speed, scope and the breadth of its social impact" (Kasinitz, 1995, p.1).

Cities change over time to address the needs of the resident populations. Storefronts change consistently based on the community, and the composition of a city council is meant to represent the diversity of interests present in each district. However, as cities have undergone dynamic changes, urban public spaces have not. Public space has not adequately met the changes of society. It is single-minded.

As noted earlier, Walzer distinguishes between single-minded public space and open-minded public space. Single-minded space is designed with one purpose in mind; shopping centers, highways, and financial districts, are single-minded spaces (Walzer, 1995). These types of space cause a sense of hurry, making people move through the space quickly, from point A to point B without stopping. Walzer points out that this can be seen at shopping malls, where a shop-

per moves expeditiously from store to store with the mindset of buying a particular item (Walzer, 1995). Conversely, open-minded space is designed for a variety of uses, possibly unforeseen, and is used by citizens who take part in different activities and are prepared to tolerate the activities of others (Walzer, 1995).

It would be easy to categorize much of what is perceived as 'public space' today as single-minded. For example, new commercial and retail developments are touted for creating a sense of urbanity, but in reality they act against the nature of cities by serving a single purpose. The user of this type of space is influenced only by the factors that brought the space into being. Shoppers at a mall are there only to shop and typically cannot be engaged by activities that the shop owners do not permit. Urban plazas in financial districts are there to serve the workers in the surrounding buildings. Anything that may not coincide with the interests of the businesses in the immediate area is prohibited. Political discourse, the spur behind great spaces such as the National Mall in Washington, DC, could not happen in many of today's spaces; or at least it has to be "permitted" by an authority, and subject to police scrutiny. Single-minded spaces create a sense that our actions are constrained; that we must behave a certain way in such a space. This excludes the informal, ad hoc activities that showcase the diverse culture in which we live. Single-minded spaces cut users off from the lifeblood of the city.

Single-minded space is not necessarily bad; it has a place within in the structure of cities. It can lead to a more private and intimate setting that people will relate to. It has been shown that teenagers value spaces where they can view the goings-on of the neighborhood without being seen. Prospect-refuge spaces create areas where people can quietly immerse in thought and excuse themselves from the life of the city (Owens, 1994).

As the demographics of neighborhoods and cities change, the public spaces that are so important to the urban structure must also change. Different user groups require different functions in their public space. Public spaces must respond to the complexity of uses presented by the communities in order to win support. Complexity of use refers to the myriad of activities that define the community. It is the varied functional use of the same design elements by different user groups over time. The activities are active and passive, formal and informal. The typical approach has been to respond to community needs on an individual basis, creating soccer and softball fields at one park and large gathering areas at another park on the other side of town. Playgrounds become tot lots separated from the rest of the park users sometimes by an actual fence. To respond to the complexity of uses presented by the community, design elements need to be adaptable—the community must be able to use the same elements for different purposes.

Designing public space for a complexity of uses creates a unique challenge for the urban design professional. Now the designer must think about how to incorporate change in his or her design. Typically, spaces are programmed with a use, or possibly a few uses. This doesn't allow for impromptu change because whatever happens must still fit into the predetermined guidelines for the space. Walter Hood relates this in a style he calls "Improvisation", or the "spontaneous change and rhythmic transposition of nonobjective components and traditional design elements within a spatial field created by a distinct framework" (Hood, 1997, p.6). Common daily practices, called "the Familiar" are given structure through traditional forms and design archetypes to reinforce the image of the community. Improvisational design seeks to hold spontaneous change as a cultural norm and promote individual expression. The image of the city is enhanced as the Familiar "validates the existence of multiple views of life in the city, even those that are outside of the normative view" (Hood, 1997). In this way, the design of public space elements or spatial relationships relates to the functional and social patterns that characterize a community's values over the course of time (Hood, 1997). By the use of improvisational design, Hood is able to relate the cultural open space needs of the community to the available sites, while allowing the specific function of the space to transform over time as the make up of the community changes.

Similarly, architectural writer Charles Jencks has characterized improvised design as en-formality. En-formality, Jencks writes, "is more than a style and approach to design, it is a basic attitude towards the world, of living with uncertainty, celebrating flux and capturing the possibilities latent within the banal" (Jencks, 1993, p.59). Improvisational, or hybridized design becomes a creative response to a social and cultural barrier; the rising tensions between dominant and minority cultures. This becomes a way to bring other voices into the mix, to allow for the unpredictable aspects of life to permeate through the design. It creates an architectural style that is not rooted in any one dominant culture or era, but rather influenced by diversity and respondent to all cultures. Jencks calls this style "Hetero-architecture." Regardless if it is called "mprovisational design," "en-formality and hetero-architecture," or "hybridized" design, it is "important for defining public space or, rather, redefining it in such a way that different people can enter into a fluid social situation" (Jencks, 1993, p.124).

It seems that the case being made for improvisational, or hybridized design is the case for more simplistic design in public spaces. This is not the case. The seemingly simplistic design of many historically successful spaces hides the com-

plex interweaving of cultures that makes up the structural framework of the space. In the Quang Trung housing development in Vinh, Vietnam, the modernist approach to multiunit housing design failed, giving way to informal "improvements" by the building residents. Here hybridized design came at the expense of poor housing design. In Lafayette Square in Oakland, California, Walter Hood proves that simplistic design elements in the right social context create park spaces that will be used by the community.

In the late 1920s and 1930s, the Congress Internationaux d'Architecture Moderne (CIAM) touted that modernist architectural design could improve living conditions across the globe. These prefabricated housing units were seen as a success in solving the urgent housing crisis in Europe following World War II. After the Vietnam War, the German Democratic Republic gave as gifts to Vietnam numerous housing developments to solve its sudden housing shortage. However, the apartment units were designed using the European housing model; small, nuclear families, access to public facilities, and less harsh climate suited to concrete building materials. The influence of local customs soon took over the new buildings and families began to adapt the living space to suit their own needs. The need for additional space for family members caused residents to build illegal and very unsafe unit extensions onto balconies. The already small units were further stressed by the need for storage space for bicycles and motorbikes. To compound the problem, the building materials selected for the buildings did not fit the climate of Vietnam with its excruciatingly hot summers and terrific typhoons in autumn. The public space provided at the foot of the buildings did little for the people, causing them to convert ground units into ad hoc shops, markets, restaurants and meeting places (Shannon, 2001). The Quang Trung housing estate clearly shows how single-minded design fails in a situation where communal interests are at play.

Located in a historic district near downtown Oakland, Lafayette Square was at one point a convalescence point for homeless, transients, and drug dealers. Analyzing the historic patterns of the park as well as the patterns of the current users, Hood was able to develop a mosaic that wove the park's historical uses as well as the interests of the community into a flexible space which speaks to all groups, including the homeless. Designed into the park were features such as a small, turfed hillock, game tables and chairs, and a 24-hour public restroom. The power of this design is that "instead of addressing [the community's] different needs by creating a homogenous setting, it accepts their diversity by offering a complex array of features woven together in time and place" (Bressi, 2001, p.13). The parks popularity can be seen by the activities of its users. An impromptu barbershop was set up on occasion in the restroom and regulars to the park fill up their water bottles using the tap outside the restroom and play chess on the provided tables. This is the true measure of success for urban public spaces.

What is being argued for in this paper is a shift in the way theorists and practitioners think about urban public space. Designers are rarely in the position of living in or making regular use of the communities or spaces they create. Therefore, landscape architects, architects, urban planners, and designers, must go further than ever before to design spaces that truly serve the interests of the community. Urban spaces must be thought of as hybrid places, where different values mingle with one another forcing unpredictable events to occur. The ideas of improvisational design and en-formality can guide designers towards spaces that live and breathe as part of the community, rather than exist as static and forlorn components of the city. Thomas Angotti writes:

> Neighborhoods are both myth and reality. As reality they are objective phenomena that arise from metropolitan growth within particular economic and historical contexts… However, there is also a subjective aspect of neighborhood development. Every neighborhood is to a greater or lesser degree, a myth that evolves in the collective consciousness of its people. Planners may serve that myth or they may seek to manipulate it, but they cannot avoid it. (Angotti, 1993, p.207).

It is the myth that defines the subjective nature or culture of a community, and urban public space design must step up and answer to that myth. No longer can they ignore it to serve single issue driven interests. This is how communities can take back their parks and how designers can make it happen.

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APPENDIX F
EDUCATIONAL ACTIVITIES AND OPPORTUNITIES

by Jon Loxley

Celebrating nature in the middle of the city through education and active involvement are two ways in which the design team of the RiverLink study would like to encourage public participation in the planning, development, and stewardship of community open spaces.

The educational value of having the community involved in the stewardship of Long Beach open space is a commitment of the Long Beach Department of Parks, Recreation and Marine. The department's programs are designed to enhance the understanding of the local environment.

Adopt-A-Wetland

The Adopt-a-Wetland program is similar to the Adopt-a-Beach program. A wetland, however, is an extremely delicate ecosystem, where the relationship between plants and animals are extremely fragile and must be protected. For this reason, volunteers are asked to participate in a one time training program that will prepare them for the sensitive area before they are given assignments.

Dedicate-A-Tree

Long Beach Parks, Recreation, and Marine offers a unique and thoughtful way to recognize individuals and/or special occasions by having a tree planted in a city park.

Adopt-A-Park Program

The Adopt-a-Park program allows individuals or groups to adopt a park in the City of Long Beach. Through such adoption, responsibility is assumed for one year of litter removal, beautification, major or minor improvements, or any combination of the above.

The RiverLink study supports the department's current efforts and includes the following examples of environmental education activities as specific ways the youth of the westside of Long Beach can be active and engaged in their open spaces.

Heritage Trees: Growing a Greener Long Beach

The urban forest applications proposed by the RiverLink study will be in need of a source of tree stock. The youth of Long Beach could develop nursery space within the schoolyards to propagate street tree seedlings. The recommendation of the design team is to collect seed form local heritage trees for the stock. This encourages the use of trees from local sources and teaches youth the importance of a healthy urban forest.

Living with Wildlife in the Urban Setting: Analyzing Urban Habitats

(Adapted from the Illinois Department of Natural Resources, 2003)

Purpose

In this activity students will survey, compare, and evaluate different urban sites as habitats for people, plants, and wildlife. They learn that human and wildlife habitats must fill certain similar needs. This study leads the students to a clearer understanding and expression of their feelings about plants and animals in the urban context.

Learning Objectives

After completing this activity, students will be able to:

- Identify two ways in which urbanization harms habitats

- Identify two ways in which urbanization can improve habitat for wildlife
- Identify three kinds of wild plants and animals that are able to thrive in the students' urban area, and explain one way in which urban conditions favor these species

Materials Needed

- Field guides (optional)
- Pictures of an underdeveloped area in your region; if possible, historical pictures taken in your urban area before much development took place
- Thermometers (best as a sunny day activity)
- Student data sheet
- Pencil
- Clipboard or stiff cardboard with paper clip or binder clip
- Watch or timer

Directions

Display pictures of undeveloped areas on the bulletin board. Introduce the concept of habitat. Ask the students to define the word "habitat" (the place where a plant or animal lives and finds the conditions it needs to survive, such as food, water, shelter). What is a student's habitat?

In creating urban habitats, people have changed previously existing habitats. Ask the students to compare the pictures of underdeveloped areas with their urban habitat. List some of the factors that have changed and some that have remained the same. Include biological factors (e.g., plants are removed permanently when large areas are paved) and physical factors (e.g., water is less available when rain is carried off in sewers). Involve the students in selecting two sites for study, one natural site and one site that is highly developed.

Take the students out to the sites, break into groups, and distribute materials. Take extra data sheets if you want the students to study and compare more than two sites.

Using the data sheets as guides, have students survey the habitats they are visiting. They should name or draw plants and animals they see, or use field guides to check identifications and other facts.

When the data sheets are completed, gather the students to compile profiles of the animals and plants that could live in the habitats they surveyed. They should share their own data with the class (or with their small group) to determine the following information: Where can the animal find its food? Are there natural food sources? Must the animal depend on human-provided supplies (including garbage)? Could an animal that was disturbed by noise live here? Is there a variety of food to eat and places to hide? Consider all the factors on the data sheet.

How many and what kinds of animals and plants were seen in the different habitats? How do living conditions compare in the habitats? Following this survey, encourage students to begin keeping wildlife logs.

Follow-Up

Some of the animals that survive best in the environment are not those that people enjoy having around. Animals like rats, cockroaches, pigeons, starlings, etc., are considered pests by many people. List urban habitat conditions that favor these "pest" animal populations (e.g., availability of food, cover, and nesting space). How might habitats be changed to control them (e.g., clean up garbage, design buildings with fewer nesting opportunities)? What conditions favor animals or plants that the students find desirable (e.g., nut-bearing trees encourage birds and provide protection from dogs and cats)?

Living with Wildlife in the Urban Setting: Improving Urban Habitat

(Adapted from the Illinois Department of Natural Resources, 2003)

Purpose

In this activity students learn how people can take action to encourage wildlife in their cities. Students investigate specific techniques used to improve urban wildlife habitats. They have a chance to apply these techniques using a habitat improvement plan they develop for a small local park, lot, or yard.

Learning Objectives

- Identify three kinds of wild plants or animals desired in the city and discuss ways to increase the populations of those species
- State three ways wildlife numbers can be increased or decreased in the city
- Draw a plan (map) to improve an area for wildlife by increasing diversity in the habitat

Materials for Project

- Books with pictures of wildlife and plants
- Books with pamphlets concerning wildlife habitats
- Colored pencils
- Data sheets

Directions

Contact, or let the students contact, one or more individuals or local groups involved with encouraging city plant and animal populations (e.g., garden clubs, environmental associations, Audobon Society, parks department, and others).

Invite representatives of these groups in to discuss planning for urban wildlife. What does the organization do to help wildlife? Ask the speakers to bring pictures or slides.

Help the group choose a site to develop a management plan. The area need not be large; areas ranging from the size of a window box to the size of a city park can be managed for wildlife. Part of a schoolyard, park, vacant lot, right-of-way, or cemetery can be used. Try to choose an area that will not be disturbed when the students implement their plan. Be sure to obtain any necessary permission from the owner or proper authority (principle, neighborhood association, cemetery manager, etc.) and write a thank-you note after the field trip.

Divide students into small groups and instruct them to draw maps of the area noting its good and bad points as wildlife habitat.

Encourage the students to look through the books and pamphlets you have available and to develop a list of species that can live in the habitat and species they would like to see more often. Discuss with the students the positive and negative aspects of increasing these species. Using their maps, they should then design a management plant for these species. This is surprisingly easy to do, and there is a lot of help available. The plans need not be complex. They should include ideas for reducing pollution on the site if possible and for increasing diversity of wildlife habitat by providing self-sustaining sources of food, water, and cover.

Habitat improvements can include: allowing a grassy area to "go wild" (the taller grass will provide food and cover; check city ordinances for guidelines on permitted height of plants), providing nest boxes for squirrels, and planting shrubs for food and cover or as a buffer between a busy area and your "refuge."

Natural food sources (vegetation) are recommended over artificial feeders because they require less maintenance.

Discuss undesirable plant and animal species in the management areas

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APPENDIX G
NATIVE AND ADAPTED PLANT LIST

The following list provides plant materials suitable for general use along the Long Beach reach of the Los Angeles River. This list also applies to plantings at RiverLink Connections, along Pathways, and within Destinations. The plants are categorized based on appropriate habitat type as classified in the Urban Nature portion of *The Long Beach RiverLink: Connecting City to River* document. This is not a comprehensive list, however, it does reflect plants appropriate for use in Long Beach based on climate, historical occurrence, and habitat potential.

General Communities

Coastal Sage Scrub

Chamise
Adenostostoma fasciculatum

Coastal Sagebrush
Artemesia californica

Coyote Bush
Baccharis pilularis

Monkey flower
Diplacus longiflorus

Chaulk Dudleya
Dudleya pulverulenta

Coast Brittle Bush
Encelia californica

California Fuchsia
Epilobium canum

Wild Buckwheat
Eriogonum fasciculatum

Golden Yarrow
Eriophyllum confertiflorum

Bladder Pod
Isomeris arborea

Giant Wild Rye
Elymus condensatus

Nevin's Barberry
Mahonia nevinii

Bush Monkey Flower
Mimulus aurantiacus

Wax Myrtle
Myrica californica

Royal Penstemon
Penstemon spectabilis

Hollyleaf Cherry
Prunus ilicifolia

Spiny Redberry
Rhamnus crocea

Lemonade Berry
Rhus integrifolia

Sugar Bush
Rhus ovata

White Flowering Current
Ribes indecorum

White Sage
Salvia apiana

Cleveland Sage
Salvia clevelandii

Purple Sage
Salvia leucophylla

Blake Sage
Salvia mellifera

Whooly Blue Curls
Trichostemma lanatum

Oak Woodland
Columbine
Aquilegia formosa

Manzanita spp.
Arctostaphylos ssp.

Ceanothus spp.
Ceanothus spp.

Western Redbud
Cercis occidentalis

California Poppy
Eschschozia californica

Toyon
Heteromeles arbutifolia

Giant Wild Rye
Leymus condensatus

Oregon Grape
Mahonia aquifolium

Creeping Mahonia
Mahonia repens

Deer Grass
Muhlengergia rigens

Purple Needle Grass
Nasella (Stipa) pulchra

California Polypody
Polypodium californicum

Coast Live Oak
Quercus agrifolia

Engelmann Oak
Quercus engelmannii

Currants,Gooseberrys
Ribes spp.

Coffeberry
Rhamnus californica

Hummingbird Sage
Salvia spathacea

Blue-eyed Grass
Sisyrinchium bellum

California Nightshade
Solanum douglassii

Riparian
Big Leaf Maple
Acer macrophyllum

Box Elder
Acer negundo var. californicum

White Alder
Alnus rhombifolia

False Inigo Bush
Amorpha fruticosa

Colombine
Aquilegia formosa

Douglas Mugwort
Artemesia douglasiana

Mule Fat
Baccharis salicifolia

Soap Lily
Chlorogalum pomeridianum

Miners Lettuce
Claytonia perfoliata

Dogwood
Cornus sericea

California Poppy
Eschschozia californica

Velvet Ash
Fraxinus veluntina

Toyon
Heteromeles arbutifolia

California Coral Bells
Heuchera spp.

Pacific Coast Iris
Iris douglasiana

Scalebroom
Lepidospartum squamatum

Scarlet Monkey Flower
Mimulus cardinalis

Western Sycamore
Platanus racemosa

Fremont Cottonwood
Populus fremontii

Coffeeberry
Rhamnus californica

Golden Currant
Ribes aureum

Spreading Gooseberry
Ribes divaricatum

California Rose
Rosa californica

California Blackberry
Rubus urisinus

Narrow -Leaved Willow
Salix exigua

Goodding's Black Willow
Salix gooddingii

Red Willow
Salix laevigata

Yellow Willow
Salix lucida ssp.lasiandra

Arroyo Willow
Salix lasiolepis

Elderberry
Sambucus mexicana

Hedge Nettle
Stachys ajugoides

Blue-eyed Grass
Sisyrinchium bellum

California Bay Laurel
Umbellularia californica

California Wild Grapes
Vitis gerdiana

Coastal Salt Marsh

Saltwort
Batis maritima

Saltmarsh Dodder
Cuscuta salina

Alkali Heath
Frankenia salina

Jaumea
Jaumea carnosa

Sea Lavender
Limonium spp.

Pickleweed
Salicornia spp.

California Cordgrass
Spartina foliosa

Seepweed
Suaeda spp.

Coastal Strand/Dune

Red Sand Verbena
Abronia maritima

Silver Beach-bur
Ambrosia chamissonis

Beach Saltbush
Atriplex leucophylla

Sea Rocket
Cakile maritima

Beach Primrose
Camissonia cheiranthifolia

Saltgrass
Distichlis spicata

Mock Heather
Ericameria ericoides

Dune Lupine
Lupinus chamissonis

Ice Plant spp.
Mesembryanthemum spp.

Freshwater Marsh
Yerba Mansa
Anemopsis californica

Biennial Sagewor
Artemisia biennis

Mosquito Fern
Azolla filicoides

Sedge spp.
Carex spp.

Western Goldenrod
Euthamia occidentalis

Rush spp.
Juncus spp.

Duckweed spp.
Lemna spp.

Pond Lily
Nuphar luteum

Water Smartweeds
Polygonum amphibium

Knotweed
Polygonum arenastrum

Pondweed spp.
Potamogeton spp.

Water-cress
Rorippa nasturtium-aquatica

Tule spp.
Scirpus spp.

Valley Grasslands
Three-awn
Aristida spp.

Wild Oats
Avena spp.

Brome Grass
Bromus spp.

Mariposa Lily
Calochortus spp.

Owl's Clover
Castilleja spp.

Larkspur
Delphinium spp.

Blue Dicks
Dichelostemma spp.

Filaree
Erodium spp.

California Fescue
Festuca californica

Tarweed
Hemizonia spp.

June Grass
Koeleria macrantha

Giant Wild Rye
Leymus condensatus

Ryegrass
Lolium spp.

Deer Grass
Muhlengergia rigens

Meadow Nemophila
Nemophila spp.

Harding Grass
Phalaris spp.

Bunchgrass
Poa spp.

Coast Live Oak
Quercus agrifolia

Engelmann Oak
Quercus engelmannii

Valley Oak
Quercus lobata

Buttercup
Ranunculus spp.

Blue-eyed Grass
Sisyrinchium bellum

Sow-thistle
Sonchus spp.

Needle-grass
Stipa spp.

Notes